User Manual

Revision 4.110
English

CAN Bus Analyzer

(Order Code: HD67216)

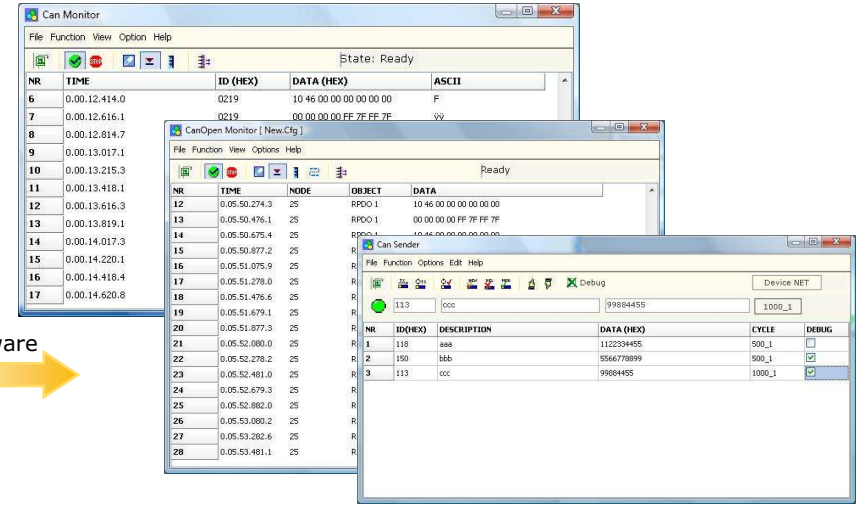
for Website information:
www.adfweb.com?Product=HD67216

for Price information:
www.adfweb.com?Price=HD67216

Benefits and Main Features:

- CAN Analyzer Advanced 2.0A, 2.0B (11 and 29 bit identifier);
- Free updating to lifetime;
- Master DeviceNet utility;
- Opto-isolated CAN port;
- HW filter for CAN/CANopen packet;
- MAX baud rate 1Mb;
- Industrial temperature range -30°C / 70°C (-22°F / 158°F)

Software



Tools

CAN/CANopen Tools:

- CAN bus Monitor
- CANopen Monitor
- CAN sender
- Network Manager
- COB-ID filter
- SDO and PDO filter
- Mask filter

Similiar Products

For others Gateways / Bridges:
CAN /RS232
See also the following link:
www.adfweb.com?Product=HD67190

Do you have an your customer protocol?
See the following links:
www.adfweb.com?Product=HD67003

Do you need to choose a device? do you want help?
Ask it to the following link:
www.adfweb.com?Cmd=helpme

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UPDATED DOCUMENTATION:

Dear customer, we thank you for your attention and we remind you that you need to check that the following document is:

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REVISION LIST:

Revision	Date	Author	Chapter	Description
1.005	19/06/2006	Ddt	All	documentation code changed
2.000	06/04/2007	Av	All	New software version
2.001	11/04/2007	Av	All	Discontinued software
2.002	22/06/2007	Av	All	Revision
3.000	25/06/2007	Av	All	New software version
3.001	26/06/2007	Av	All	Revision
4.000	05/07/2007	Av	All	New document format
4.001	11/07/2007	Av	All	Change accessories code
4.100	23/01/2008	Av	Load EDS file	New software version
4.110	14/02/2008	Av	Basic concepts about CAN	Revision

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INTRODUCTION:

The CAN Analyzer is a powerful, flexible and economic instrument which develops and verifies system based in CAN-CANopen.
This product allows for the study and configuration of CANopen systems, using a user interface that permits a simple access to devices and their objects.

The instrument is composed of the following: module hardware with a RS232 interface that connects to a personal computer and a CAN terminal that connects to the line; a Null modem serial cable and software for MS Windows.

THE SOFTWARE:

To obtain software please go to http://www.adfweb.com/home/download/download.asp.
(This manual is referenced to the last version of the software present on our web site)
The software is composed of various windows that are controllable from a main window which allows access to the different CAN Analyzer functions.

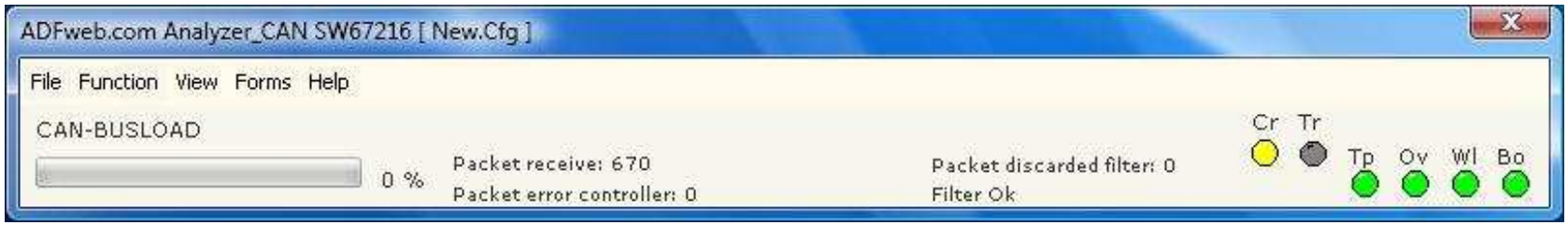


Figure 1: Main window for SW67216

***Status Desc* indicates:**

- Packet receive: the number of CAN bus packages received from the hardware device.
- Packet discarded Filter: the number of the CAN bus packages discarded from the hardware device.
- Packet error controller the number of CAN bus packages discarded erroneously from the Controller CANbus.
- Send Filter - Bad Filter - Filter Ok: the state of the filter configurable from the software.

***Status LED* indicates:**

- Cr: Color gray if the CAN Bus network was not activated
- Tr : Color red if sending data to the Hw CAN Analyzer device
- Tp: Color red if the CAN Transmitters are occupied
- Ov : Color red if overwriting is verified within the receive CAN
- Wl : Color red if there are communications errors on the CAN during transmission and reception
- Bo : Color red if the CAN bus network is always in error.

The Bus Load indicates the load level on the line. Normally, a line does not carry a load over 30%. A long period of time with an abnormal load may indicate that the applications are excessively using the BUS.
This could be caused by an incorrect cable connection (use of the terminal resistors) or the presence of device that functions at a different BAUD RATE than the one set in the analyzer.

The "menu" and "tool bar" access a series set-up possibilities such as:

- communication configuration
- baud rate of the bus
- turning on and off the hardware.

BAUD RATE OF THE BUS:

In this menu is possible set the baud rate of the bus and set the protocol (Standard and extended):
Standard is CAN2.0A and extended is CAN2.0B.

The "Form list" controls the opening of the windows that access the various CAN Analyzer functions.

The "CAN Monitor" is a window that allows the visualization of the BUS data at the package level.
The "CAN Sender" is a window that allows CAN packages to be send into CAN line.

The "CANOpen Monitor" is a window that allows for the visualization of BUS data, interpreting it as CANopen packages.

The "Network Manager" is a window that allows for control of the CANopen modules inserted in the line. It can scan the network to find modules and for each one, it reads the object dictionary.

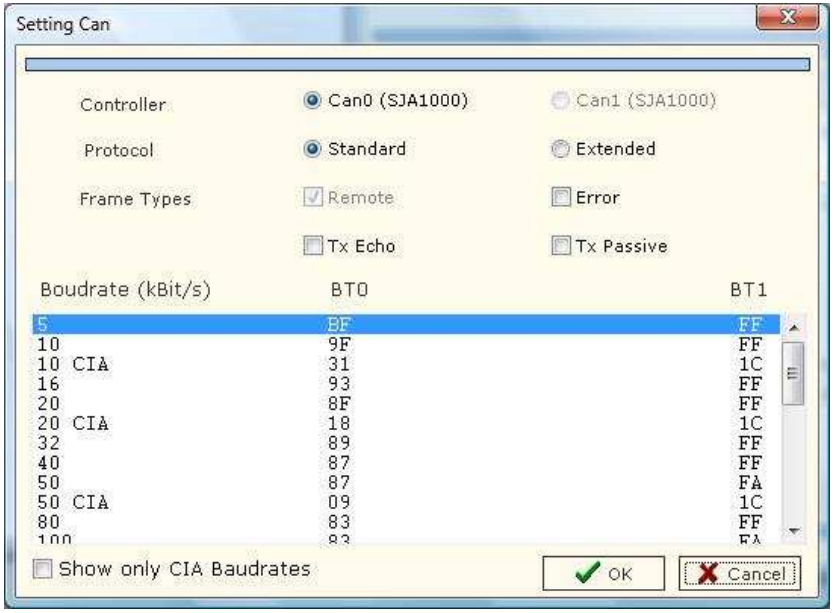


Figure 2: "Setting Can" window

CAN MONITOR:

It is the window that allows the visualization of the BUS data at the package level and its columns mean the following:

- Time: indicates the time in which data is received
- Id: indicates the Identifier
- Data: indicates the data byte of the CAN package (they can be from 0 to 8)
- ASCII: representations of the received data in ASCII char.

the buttons on the tool bar allow the following actions:

- "Export Excel": allows for the exportation of the entire content of the grid as a text file.
- "CAN Start" and "CAN Stop": activate or stop the writing of the packages in the grid.
- "Clear" eliminates the grid content.
- "Lock Recent Entities" visualizes the last CAN package.
- "Scroll/Overwrite Mode": serves in the choice to write all packages one after another in the grid or to write all of them in the same row.
- "Filter" opens the window for filter set-up.

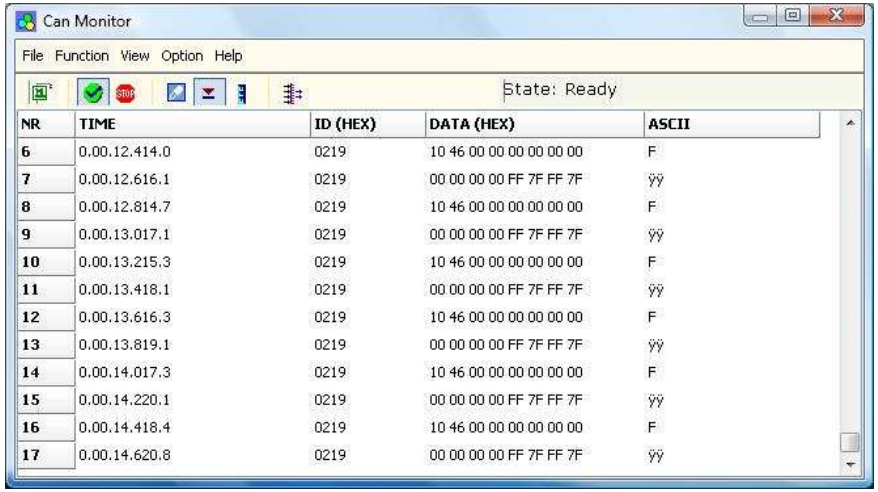


Figure 3: "Can Monitor" window

The filter is an instrument that allows the hardware module to eliminate package that it does not want to be visualized in the CAN Monitor Window. (Note: the filter reacts on the Identifier section of the package)
By pressing the "Filter" button from the "Can Monitor" window the "Filter" window appears (Fig. 4):
On the set-up windows for the filter, there are two lists:

- on the right, the list of the Identifiers ($0-$7FF) of the packages to be visualized.
- On the left, those lists to be eliminated.

To modify the lists, use the keys "<<", ">>", "ALL" and "NONE" to move an Identifier from one list to another, bring them to the right (shown) or the left (hidden).

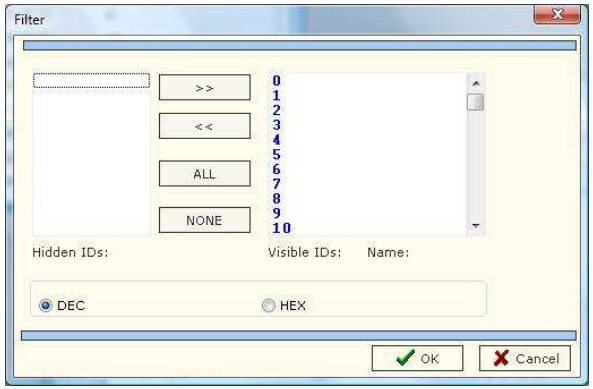


Figure 4: "Filter" window

When the protocol is extended by pressing the "Filter" button from the "Can Monitor" window the "Filter" window appears (fig 5):

This window is for setting COB-ID Filter.

In this window there are:

- A text area on the left for insert the COB-ID in the filter
- A big area on the right for display the COB-ID inserted
- Two buttons for add or delete the COB-ID
- Two options for set the filter to "type positive" or "type negative"

For insert a COB-ID in the filter you have to digit the COB-ID in the first text area and click on the "add" button. Now the COB ID compare on the right box.
For delete a COB-ID you have to select the COB-ID to remove and click on the "delete" button.

You can choose two type of the filter: positive or negative, by clicking on the relative option.
With the positive type filter on the CAN monitor you visualize only the COB-ID added
With the negative filter type on the CAN monitor you visualize all COB-ID except the COB-ID added

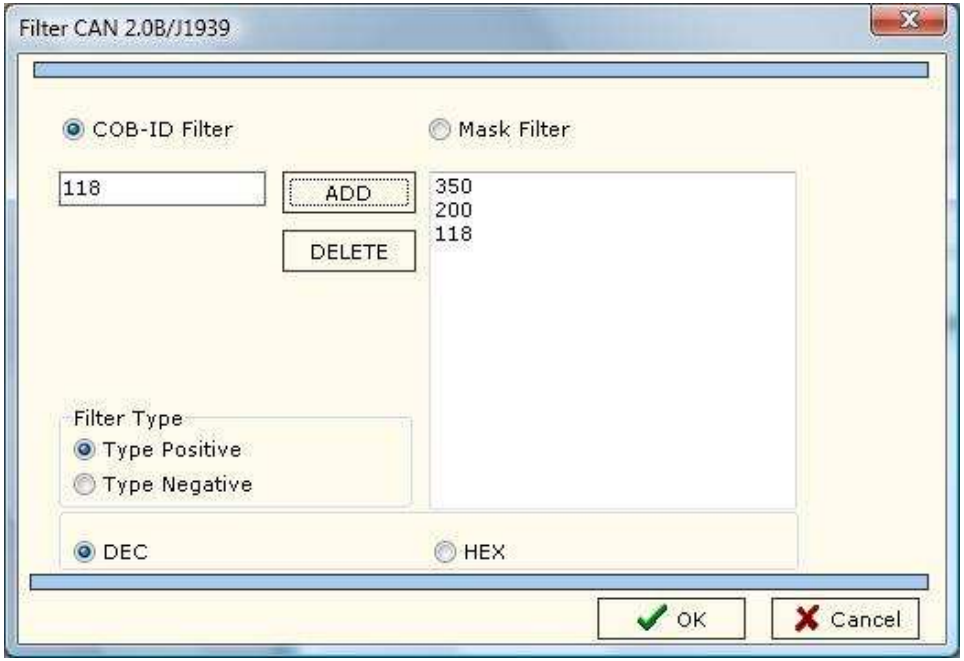


Figure 5: COB-ID Filter window

By clicking on "Mask Filter" appears this window:

In this window you can set a mask filter.

In the first text area you can write the COB-ID to add to the list. The COB-ID must be in binary code.
When you insert the COB-ID you can insert some variables (x), the variable can be 0 or 1.

Example:
COB-ID "10xx11"

On the CAN monitor you can visualize the following COB-ID:
100011
100111
101011
101111

You can insert also the COB-ID without variables, in this way:

Example 2:
COB-ID is 110100
On the CAN monitor you can visualize only the COB-ID 110100

You can add or delete the COB-ID by clicking on the relative buttons.

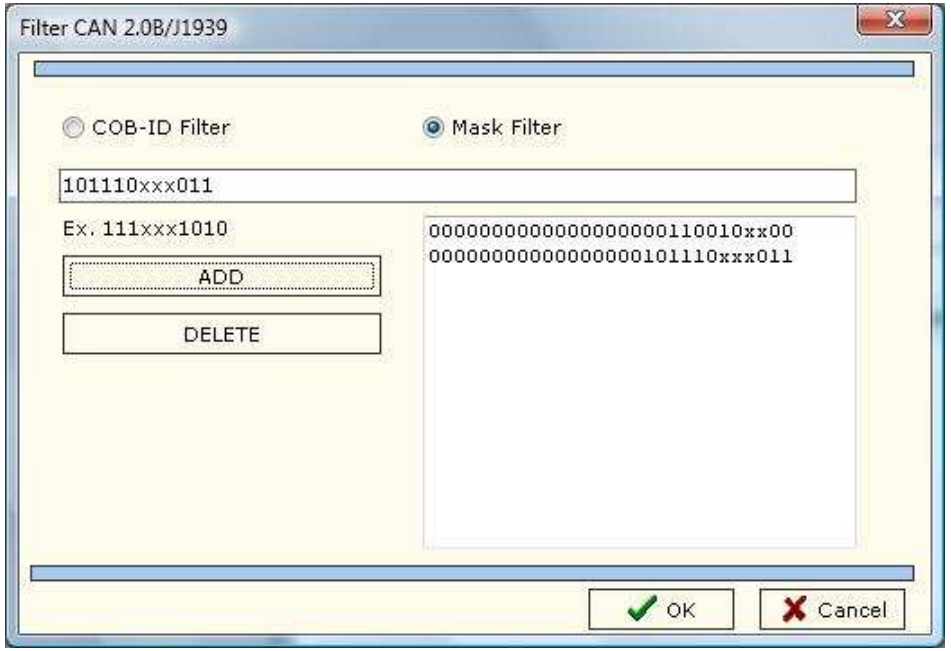


Figure 6: Mask Filter window

CAN SENDER:

It allows for data to be send in the network. The package is built by its Identifier and its data.
The window allows a list of packages to be created, then are visualized on the grid.
To add a new package, write the values in the text fields and then choose "Edit New". The new package extends the table at the first available row. Otherwise, to modify a row, select it and choose the option "Edit Modify". "Edit del" eliminates the selected row.
From the "Function Menu", choose "Transmit Current Object" to send the package one single time. Choose "Transmit Cycle" to send it cyclically.
The "Debug" function send only the selected package, if the main checkbox on top is checked. For select the package to be sent you have to check the debug on the end of the line.

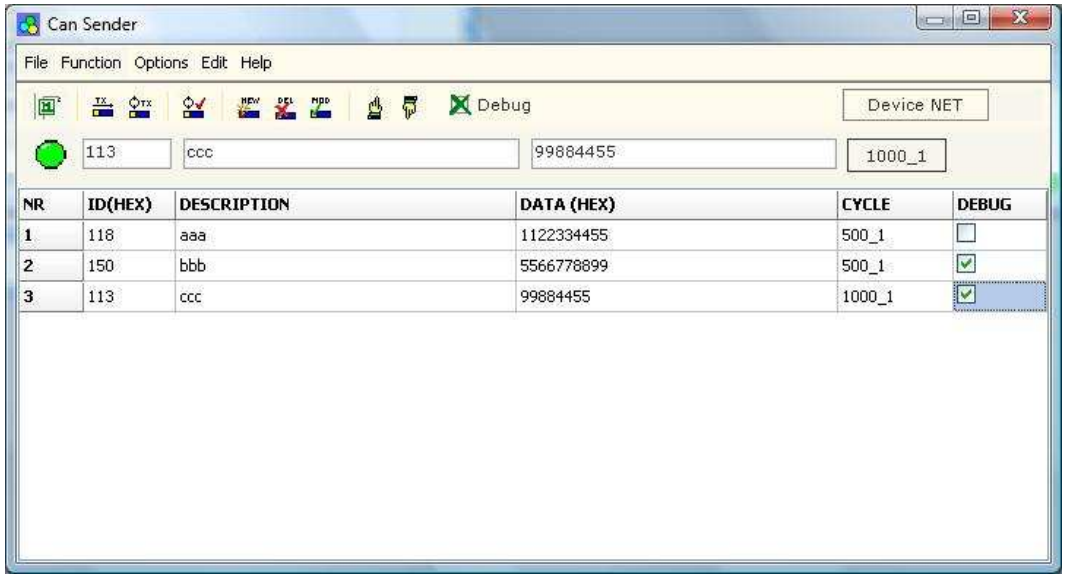


Figure 7:"Can Sender" window

The function "Transmit cycle" automatically sends the CAN package every X millisecond set-up on the provided window by pressing the button above the cycle column in the grid or menu options → "Cycle Options".
By pressing the "Transmit cycle" button from the "Can Sender" window the "Cycle Options" window appears (Fig. 8):

The set-up window allows for the choice of the time intervals between sending two packages and the byte to begin sending the package.
Once the package to be sent are set-up: select the row dedicated

to the package to be send and click on the transmission:

- "TX" to send one time
- and "TX Cycle" to send cyclically, if the Cycle Options are set-up.

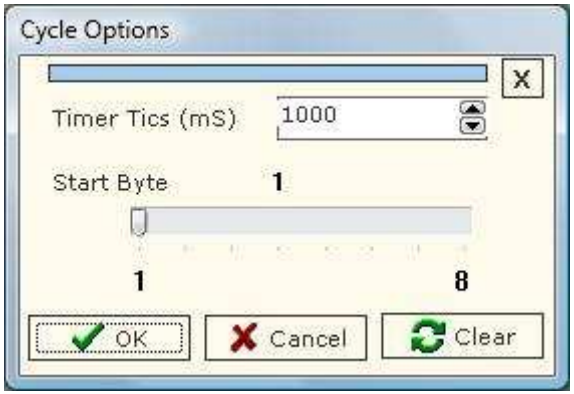


Figure 8: "Cycle Options" window

MASTER DEVICENET:

With the button "Device NET", you can access the window for the DeviceNET's Master simulation (Fig. 9).

In the window "Device NET Master Emulator", you must write the device's address only, then push the START button in order to visualize the input and output data.

In the left column you can put the data that DeviceNet's Master must write in DeviceNET's net.
In order to change the data's value, it is enough: to select the data, to write its value in the editbox on the list and to push the SEND button.

In the right column you can view all data of the slave. This column can be only read.

Push the STOP button in order to stop communication with the slave.

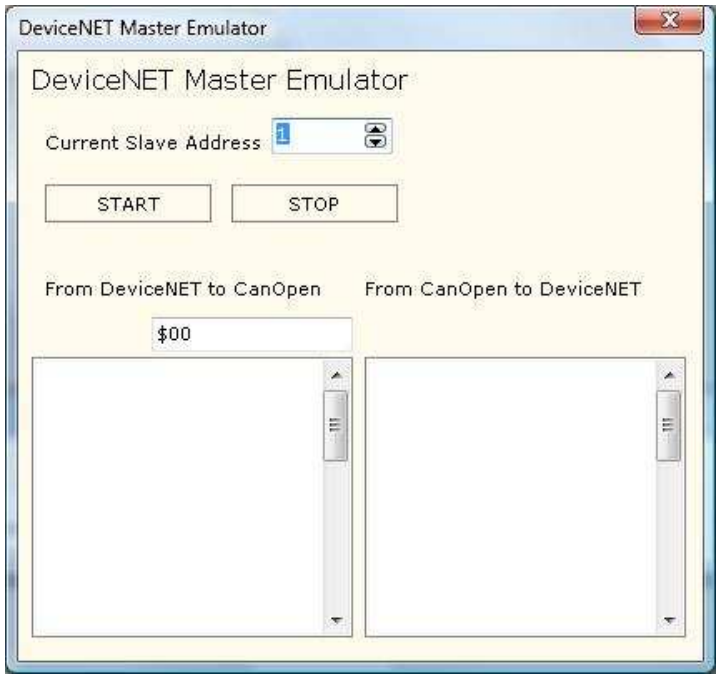


Figure 9: "DeviceNET Master Emulator" window

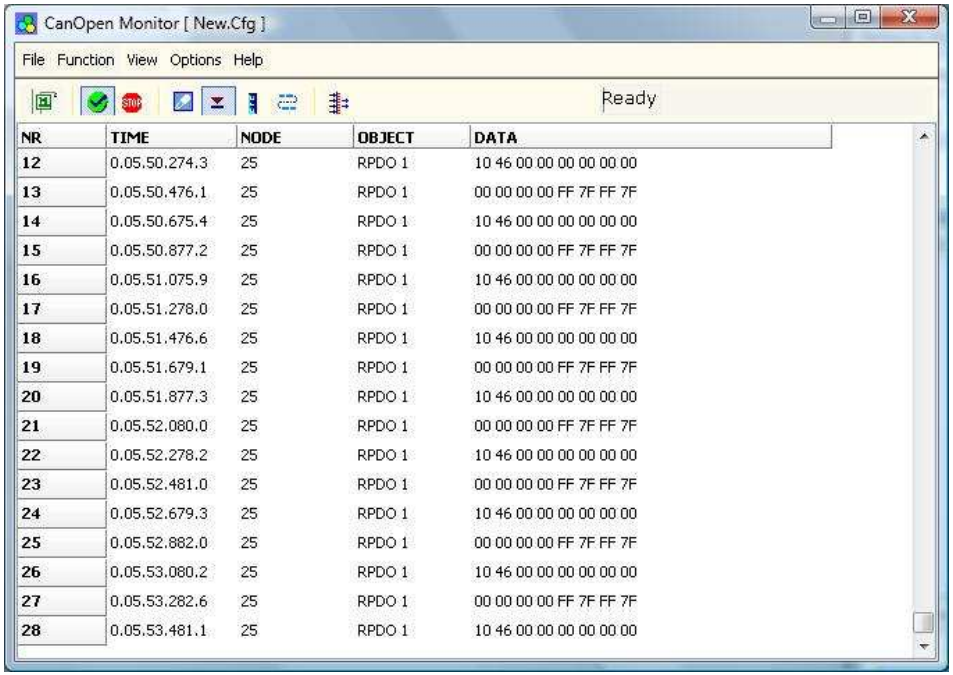
CANOPEN MONITOR:

It is a window that allows the BUS data to be visualized, interpreting the data as specified by the CANopen.
The columns mean the following:

- Time: Indicates the time that data is received
- Node: Address of the device associated with the package (1-127)
- Object: Indicates the type of object
- Data: Indicates the data related to the package (the contents depend on the type of package).

The tool bar allows for the following actions:

- "Export Excel": allows for the exportation of the entire contents of the grid as a text file.
- "CAN Start" and "CAN Stop": activate or stop the writing of the packages in the grid.
- "Clear" eliminates the grid content.
- "Lock Recent Entities" visualizes the last CAN package.
- "Scroll/Overwrite Mode": serves in the choice to write all the packages one after another in the grid or to write all of them in the same row.
- "Filter" opens the window for filter set-up.



NR	TIME	NODE	OBJECT	DATA
12	0.05.50.274.3	25	RPDO 1	10 46 00 00 00 00 00 00
13	0.05.50.476.1	25	RPDO 1	00 00 00 00 FF 7F FF 7F
14	0.05.50.675.4	25	RPDO 1	10 46 00 00 00 00 00 00
15	0.05.50.877.2	25	RPDO 1	00 00 00 00 FF 7F FF 7F
16	0.05.51.075.9	25	RPDO 1	10 46 00 00 00 00 00 00
17	0.05.51.278.0	25	RPDO 1	00 00 00 00 FF 7F FF 7F
18	0.05.51.476.6	25	RPDO 1	10 46 00 00 00 00 00 00
19	0.05.51.679.1	25	RPDO 1	00 00 00 00 FF 7F FF 7F
20	0.05.51.877.3	25	RPDO 1	10 46 00 00 00 00 00 00
21	0.05.52.080.0	25	RPDO 1	00 00 00 00 FF 7F FF 7F
22	0.05.52.278.2	25	RPDO 1	10 46 00 00 00 00 00 00
23	0.05.52.481.0	25	RPDO 1	00 00 00 00 FF 7F FF 7F
24	0.05.52.679.3	25	RPDO 1	10 46 00 00 00 00 00 00
25	0.05.52.882.0	25	RPDO 1	00 00 00 00 FF 7F FF 7F
26	0.05.53.080.2	25	RPDO 1	10 46 00 00 00 00 00 00
27	0.05.53.282.6	25	RPDO 1	00 00 00 00 FF 7F FF 7F
28	0.05.53.481.1	25	RPDO 1	10 46 00 00 00 00 00 00

Figure 10: "Canopen Monitor" window

The filter is an instrument that allows the hardware module to eliminate package that it does not want to visualized in the CANOpen Monitor Window.
By pressing the "Filter" button from the "CanOpen Monitor" window the "Filter" window appears (Fig. 11):

The set-up window of the filter allows every type of package to be visualized or not based on a specific address.

The CANopen monitor window is valid only for standard protocol.

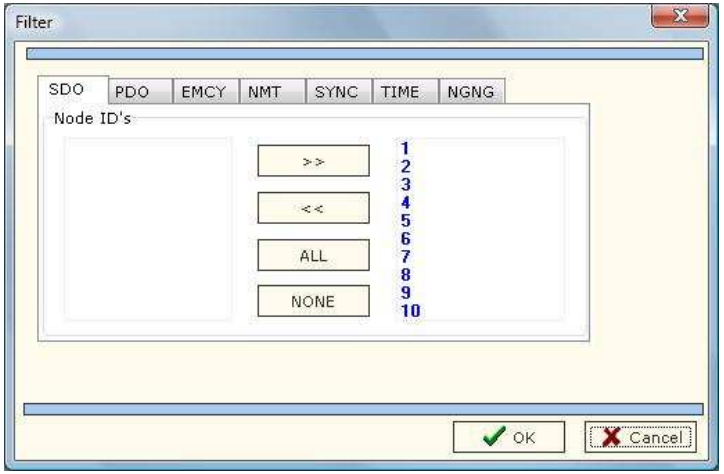


Figure 11: "Filter" window

NETWORK MANAGER:

The "Network Manager" windows allows certain operations, designed for the analysis of CANopen devices.
It is possible to scan the network through this window.

In order to identify the presence of module within the network, it is possible to read the objects of a module's Object Dictionary and send the start package to the network.
Set-up the range of addresses for the scan in order to scan the network.

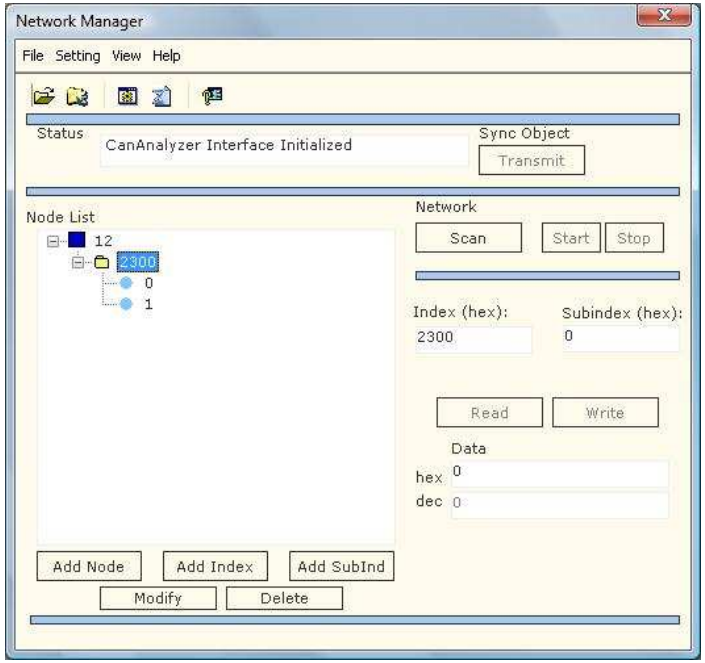


Figure 12: "Network Manager" window

Press the "Scan" button and wait for this scan. The list of the node is filled in with the found nodes. These can be added to the Index and SubIndex.
The button "Add Node", "Add Index", "Add SubIndex", "Modify" and "Delete" allow for the elaboration of the objects list.
To read the value of an object through SDO, select the object from the list and press the button "Read" and the button "Write" to write it.

The Network manager window is valid only for standard protocol.

Figure 13: "Scan range" window

LOAD EDS FILE:

By pressing the "EDS" button from the Network Manager window (Fig. 12) the window "Load EDS file" appears
(Fig. 14):

By this window is possible to load an EDS file for CANopen. Can also set as part of EDS you would load by check the field:

- Insert Mandatory object
- Insert optional object
- Insert manufacturer object

When the EDS is loaded on the network manager is possible see the varius object of CANopen device (fig. 15)

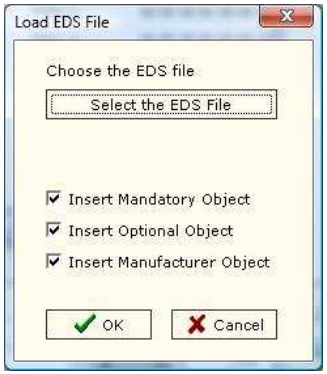


Figure 14: "Load EDS File" window

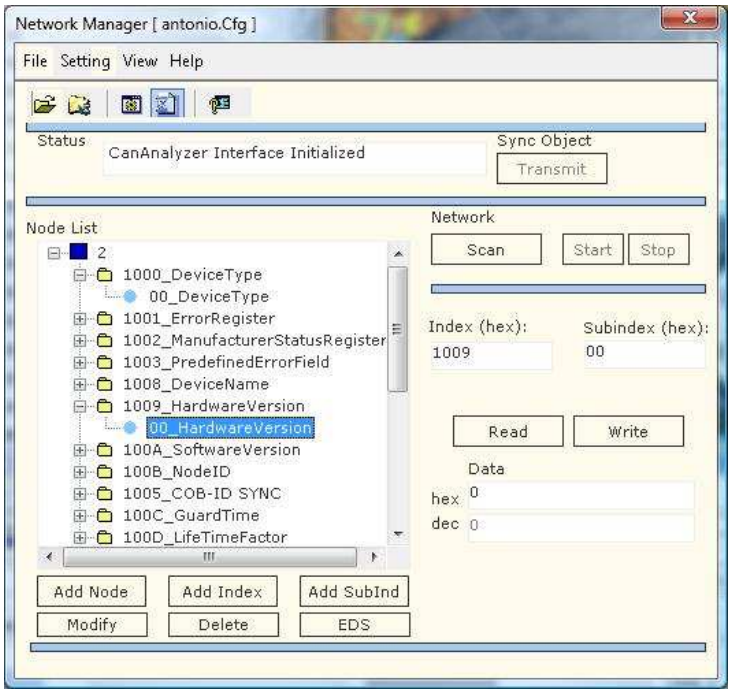


Figure 15: "Network Manager" window with EDS file

BASIC CONCEPTS ABOUT CAN:

The CAN Bus is a bus that use simple twisted cable as a physical support. It allows for the communications between several devices at the same time on the same network through an automatic control on the part of the hardware driver, package priority. It is used often in the automotive field and by automated industry.

A CAN package is composed of several parts:

- 11/ 29 bits of the Identifier,
- up to 8 bytes of data
- and other CRC bits.

The COB-ID serves to define the priority of the BUS package (note: the lower the values, the higher the bus priority).
The COB-ID bits are, in effect, defined as dominant if zero and recessive if one.
The CAN Hardware Driver and the CAN Controller (generally, the microprocessor) if there is an error during the transmission of the package, they suspend the transmission and recuperate the information automatically. This automation permits a high level of security and therefore is used in critical situations.

BASIC CONCEPTS ABOUT CANOPEN:

The CANopen is a protocol based on CAN that defines a series of set-up rules for package and interactions in which devices can communicate.

Also, CANopen brings to the generation of profiles made to standardize communication with generic modules such as I/O, Encoder, etc.

Above all, CANopen defines diverse typologies of the package, distinguished base on the COB-ID of the CAN Package (see the table below).

COB-ID	
$00	Network management
$80	Sync
$80+devadd	Emcy
$180+devadd $200+devadd	txPDO 1 rxPDO 1
$280+devadd $300+devadd	txPDO 2 rxPDO 2
$380+devadd $400+devadd	txPDO 3 rxPDO 3
$480+devadd $500+devadd	txPDO 4 rxPDO 4
$700+devadd	Nodeguarding
$600+devadd $580+devadd	SDO request SDO response

In the table, for every package "devadd" (the device address), there is a value up to $7F. A CANopen network can have up to 127 devices ("devadd" begins from 1).

We add a brief description of the meaning of the 8 bytes of data for each type of package.

Network management (Cob ID 0x00)
Byte 1 :
Identifies the type of command
Byte 2 :
Identifies the node that receives the command
Byte 3-4-5-6-7-8 :Reserved

Sync Message (Cob ID 0x80)
Byte 1-2-3-4-5-6-7-8 :
Absent
Emergency Object (Cob ID 0x80 - 0xFF)
Byte 1 : LSB Error Code
Byte 2 : MSB Error Code
Byte 3 : Error Register
Byte 4-5-6-7-8 : Manufacturer Specific Error Field

Timestamp Message (Cob ID 0x100)
Byte 1-2-3-4 :
time expressed in milliseconds
Byte 5-6 :
Number of days
Byte 7-8 :Reserved

Transmit Pdo n° 1 Cob ID 0x180 a 0x1FF
Byte 1-2-3-4-5-6-7-8 : databytes

Receive Pdo n° 1 (Cob ID 0x200 a 0x27F)
Byte 1-2-3-4-5-6-7-8 : databytes

SDO Read Response (Cob ID 0x580 a 0x5FF)
Byte1 : 010X.YY11 (0x40)
YY
Indicates how many byte of the 4 data possibilities do not contain data.
X
Indicates a bit which has an indifferent value (don't care)
Byte 2 : index byte low
Byte 3 : index byte hight
Byte 4 : subindex
Byte 5,6,7,8 : Data bytes

SDO Read Request (Cob ID 0x600 a 0x67F)
Byte1: 010X.XXXX (0x40)
X
Indicates a bit which has an indifferent value (don't care)
Byte 2 index byte low
Byte 3 index byte hight
Byte 4 subindex
Byte 5,6,7,8 Reserved

SDO Write Response (Cob ID 0x580 a 0x5FF)
Byte1 : 011X.XXXX (0x60)
Indicates a bit which has an indifferent value (don't care)
Byte 2 : index byte low
Byte 3 : index byte high
Byte 4 : subindex
Byte 5,6,7,8 : Data bytes

SDO Write Request (Cob ID 0x600 a 0x67F)
Byte1 : 001X.YY11 (0x20)
YY
Indicates how many byte of the 4 data possibilities do not contain data.
X
Indicates a bit which has an indifferent value (don't care)
Byte 2 : byte index byte low
Byte 3 : byte index byte hight
Byte 4 : subindex
Byte 5,6,7,8 : Reserved

SDO Abort (CobID 580+id)
CobID 600+id
Byte 1 100X.XXX (0x80)
Byte 2 index byte low
Byte 3 index byte high
Byte 4 subindex
Byte 5,6 Additional code
Byte7 Error code
Byte 8 Error class

Codici Error class
00 NO ERROR
05 SDO SERVICE
06 SDO ACCESS
08 SDO OTHER
Error code :
01 UNSUPP_ACCESS
02 NONEXIST_OBJECT
03 INCONS_PARA
04 ILLEG_PARA
06 HARDWARE_FAULT
07 TYPE_CONFLICT
09 INCONS_OBJ_ATTR
0A RES_NOT_AVAIL

ABORT CODE DESCRIPTION:

0503 0000h Toggle bit not alternated.
0504 0000h SDO protocol timed out.
0504 0001h Client/server command specified not valid or unknown.
0504 0002h Invalid block size (block mode only).
0504 0003h Invalid sequence number (block mode only).
0504 0004h CRC error (block mode only).
0504 0005h Out of memory.
0601 0000h Unsupported access to an object.
0601 0001h Attempt to read a write only object.
0601 0002h Attempt to write a read only object.
0602 0000h Object does not exist in the object dictionary.
0604 0041h Object cannot be mapped to the PDO.
0604 0042h The number and length of the objects to be mapped would exceed PDO length.
0604 0043h General parameter incompatibility reason.
0604 0047h General internal incompatibility in the device.
0606 0000h Access failed due to an hardware error.
0607 0010h Data type does not match, length of service parameter does not match.
0607 0012h Data type does not match, length of service parameter too high.
0607 0013h Data type does not match, length of service parameter too low.
0609 0011h Sub-index does not exist.
0609 0030h Value range of parameter exceeded (only for write access).
0609 0031h Value of parameter written too high.
0609 0032h Value of parameter written too low.
0609 0036h Maximum value is less than minimum value.
0800 0000h general error.
0800 0020h Data cannot be transferred or stored to the application.
0800 0021h Data cannot be transferred or stored to the application because of local control.
0800 0022h Data cannot be transferred or stored to the application because of the present device state.
0800 0023h Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of a file error).

UPDATE NEW FIRMWARE:

Update new firmware in the case the version of your CAN Analyzer is 15.004 or previous.

Follow these steps to update new firmware:

1. Close the CANanalyzer's software;
2. Turn off the HD67216 device;
3. Download the program for update the new firmware at this link: www.adfweb.com/download/filefold/US67216.zip
4. Insert the boot jumper;
5. Turn on the HD67216 device;
6. The led of boot blinking quickly;
7. Insert the null modem cable;
8. Execute the file FlaschWrite.exe (It is inclused in the zip CAN_Analyzer_Update.zip);
9. Select the serial port you used for the update;
10. Press the button "open File" and selected the file "CANAnalyzer_15.005.sx";
11. Press the button "Download" and wait until when it does not apper the window "Done";
12. Turn off the device and sconnect the boot jumper.

CONNECTION SCHEME (only for HD67216):

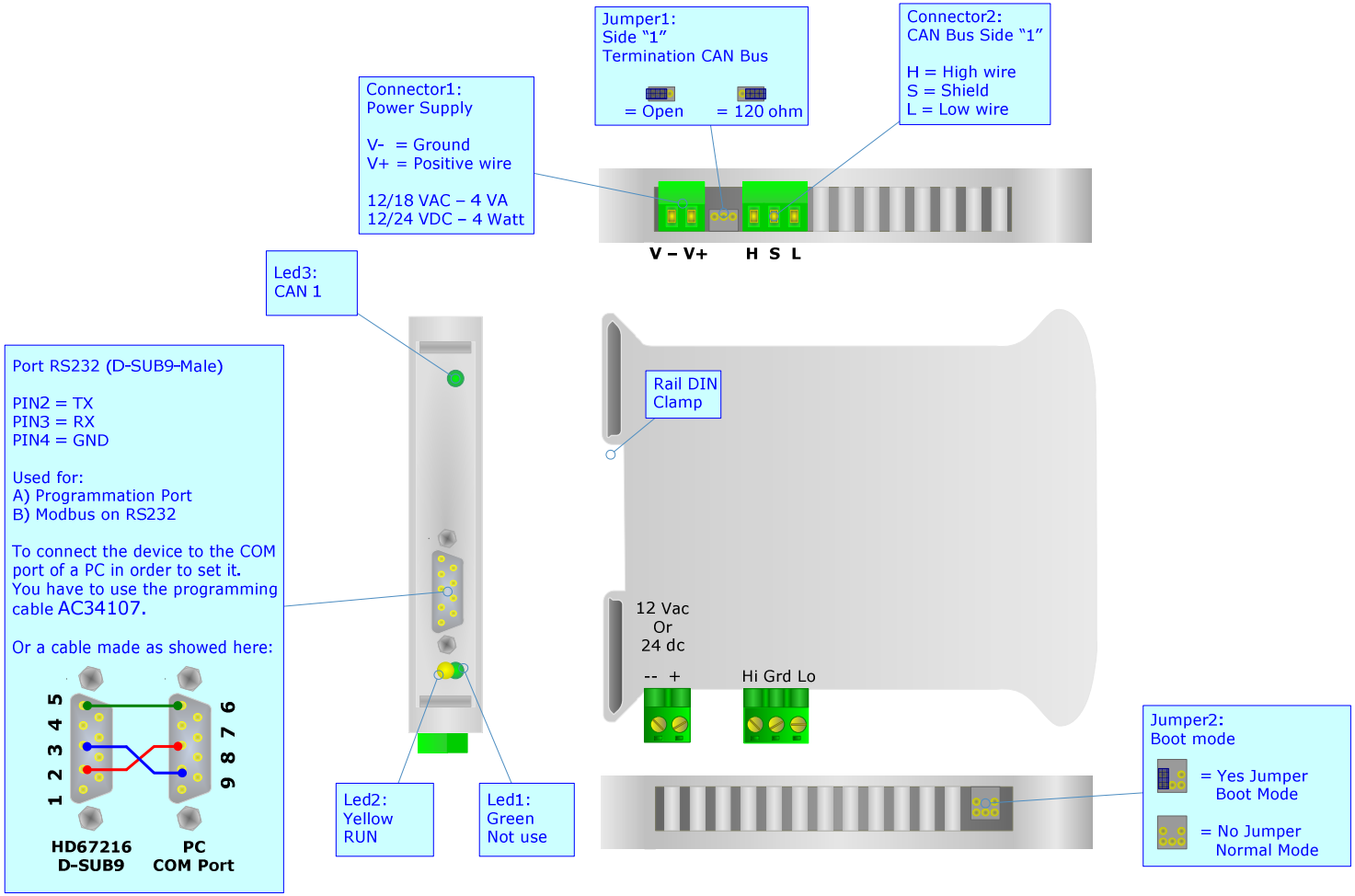


Figure 16: Connection scheme for HD67216

CHARACTERISTICS OF THE CABLES:

The connection from RS232 socket to a serial port (example one from a personal computer), must be made with a Null Modem cable (a serial cable where the pins 2 and 3 are crossed).
It is recommended that the RS232 Cable not exceed 15 meters.

Can bus cable characteristics:

DC parameter:	Impedance	70 Ohm/m
AC parameters:	Impedance	120 Ohm/m
	Delay	5 ns/m
Length	**Baud Rate [bps]**	**Length MAX [m]**
	10 K	5000
	20 K	2500
	50 K	1000
	100 K	650
	125 K	500
	250 K	250
	500 K	100
	800 K	50
	1000 K	25

MECHANICAL DIMENSIONS:

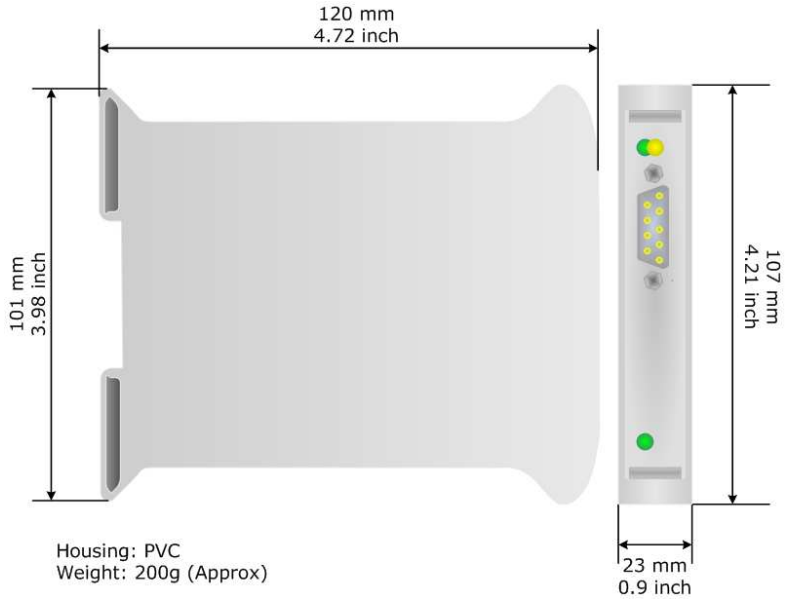


Figure 17: Mechanical dimensions scheme

ORDER CODE:

Order Code: **HD67216** - CAN Analyzer

ACCESSORIES:

Order Code: **AC34107** - Null Modem Cable Fem/Fem DSub 9 Pin 1,5 m

Order Code: **AC34114** - Null Modem Cable Fem/Fem DSub 9 Pin 5 m

Order Code: **AC34001** - Rail DIN - Power Supply 220/240V AC 50/60Hz – 12 V AC

Order Code: **AC34002** - Rail DIN - Power Supply 110V AC 50/60Hz – 12 V AC

Order Code: **AC34103** - European Input - Power Supply 230V AC 50 – 12 V DC

WARRANTIES AND TECHNICAL SUPPORT:

For fast and easy technical support for your ADFweb.com SRL products, consult our internet support at www.adfweb.com.
Otherwise contact us at the address support@adfweb.com

RETURN POLICY:

If while using your product you have any problem and you wish to exchange or repair it, please do the following:

1) Obtain a Product Return Number (PRN) from our internet support at www.adfweb.com. Together with the request, you need to provide detailed information about the problem.
2) Send the product to the address provided with the PRN, having prepaid the shipping costs (shipment costs billed to us will not be accepted).

If the product is within the warranty of twelve months, it will be repaired or exchanged and returned within three weeks. If the product is no longer under warranty, you will receive a repair estimate.

PRODUCTS AND RELATED DOCUMENTS:

Part	Description	URL
HD67121	Gateway CANopen / Canopen	www.adfweb.com?product=HD67121
HD67001	Gateway CANopen / Modbus – RTU Master	www.adfweb.com?product=HD67001
HD67004 HD67005	Gateway CANopen / Modbus – Ethernet TCP	www.adfweb.com?product=HD67004
HD67134	Gateway CANopen / DeviceNet	www.adfweb.com?product=HD67134
HD67117	CAN bus Repeater	www.adfweb.com?product=HD67117
HD67216	CAN bus Analyzer	www.adfweb.com?product=HD67216